

CLARKS BRIDGE

Yosemite National Park Roads and Bridges
Spanning Merced River on service road
Yosemite National Park
Mariposa County
California

HAER NO. CA-96

HAER
CAL
88-YOSEM,
17-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
P.O. Box 37127
Washington, D.C. 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

CLARKS BRIDGE
Yosemite National Park
HAER No. CA-96

HAER
CAL
22-YOSEM,
17-

I. INTRODUCTION

Location: Clark's Bridge carries a service road across the Merced River in the east end of the Yosemite Valley in Yosemite National Park, Mariposa County, California.

QUAD: HALF DOME, CA
UTM: 11/274120/4179830

Date of Construction: 1927-28

Designer and Builder: Designed by George D. Whittle, Senior Highway Engineer for the San Francisco district office of the Bureau of Public Roads, U.S. Department of Agriculture.

Contractors: Rocca and Caletti

Original and Present Owner: Yosemite National Park, National Park Service.

Present Use: Park road bridge; limited access.

Significance: The single-span Clark's Bridge exemplifies the so-called National Park Service "rustic style" of architecture. The third bridge on the site, the semi-elliptical arch utilizes reinforced concrete in its construction, but its granite arch and facing make it appear to be of rough stone construction.

Project Information: Documentation of Clarks Bridge is part of the Yosemite National Park Roads and Bridges Recording Project, conducted in summer 1991 by the Historic American Engineering Record.

Richard H. Quin, Historian

II. HISTORY

This is one in a series of reports prepared for the Yosemite National Park Roads and Bridges Recording Project. HAER No. CA-117, YOSEMITE NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads.

HISTORY OF CLARKS BRIDGE

Clarks Bridge spans the Merced River in the east end of Yosemite Valley, adjacent to the Yosemite Park & Curry Company stables and one-half mile northeast of Curry Village. The 126' reinforced concrete spandrel arch bridge is faced with native granite and incorporates two equestrian subways 8' wide by 10' high through its abutments. The single semi-elliptical arch over the river measures 75' 7" and is built on a skew of 20 degrees. The bridge is 47' wide, incorporating a two-lane roadway 27' wide, a 7' bridle path on the north side and a 5' sidewalk on the south. Stone guard walls border each side. The roadway is surfaced with a bituminous asphalt pavement. The bridge is faced in dioritic granite quarried from a site below Pohono Bridge. The black-veined and weathered cut stone is laid in a random pattern and bedded in mortar with raked joints. The arch ring stones or voussoirs taper out from the center. The spandrel walls are built with a maximum batter of 2:12. Concrete used in the arch rings is Class "A," while that is used in other parts is Class "B." Six expansion joints are incorporated in the spandrel walls and the haunches of the arch. Being built on rocky land adjacent to a medial moraine, the bridge abutments rest on excavated and poured footings rather than on wooden piles. In many aspects, the bridge is similar to the new Happy Isles Bridge farther upstream (completed a year later by a different contractor), but it is wider and faced with larger stones.

A ford crossed the Merced River at the bridge's location around 1883, providing a crossing for a foot trail which connected James Lamon's orchard between Tenaya Creek and the river with the Old Village to the west.¹ Following completion of the Stoneman House hotel in 1888, this trail became a broad footpath to the river. In the late summer or early fall of 1888, the "Moraine Bridge" was built here under the supervision of E. W. Chapman, one of the members of the second Board of Commissioners for the Yosemite Grant. The 61' span wooden truss bridge was constructed of heavy timbers.²

The structure was called the "Upper Bridge" in 1908, when day laborers under the supervision of the park's Army administration made repairs. The structure was renamed "Clark's Bridge" that year or in 1910 after Galen Clark (1814-1910), the first Guardian of the Yosemite Grant.³ One floor timber and the upper frame of the bridge were replaced in 1913 at a cost of \$210.⁴ The structure collapsed in 1917 and was replaced by a reinforced concrete girder structure.⁵

The National Park Service signed a Memorandum of Agreement with the Bureau of Public Roads (U.S. Department of Agriculture) in July 1925, under the terms of which the Bureau assumed responsibility for construction and rebuilding of roads in the National Parks. In Yosemite National Park, the Bureau's first projects involved the paving of Yosemite Valley roads and the replacement of the early bridges. Major improvements in the area of the bridge began with the paving of the Clarks Bridge Road and adjacent sections of the Valley floor

* Classes of concrete refer to the amount of Portland cement used in the mixture, with Class "A" having the highest proportion.

system, a 13.79-mile project, in August 1927.⁶ This followed a paving project begun for the roads in the western part of the Valley the previous year.

In 1927, the National Park Service decided to make major changes in the east end of the Valley, including replacement of bridges and construction of a new bridle path network. Clarks Bridge would be replaced, and a new bridge would be constructed at Happy Isles; these two structures would incorporate equestrian tunnels in order to eliminate grade crossings for horse riders.⁷

The new Clarks Bridge was designed by George D. Whittle, Senior Highway Engineer with the Bureau of Public Roads' San Francisco office, assisted by National Park Service landscape architect Thomas C. Vint. The design was reviewed by two members of the National Commission on Fine Arts. Several alternative designs were submitted to the National Park Service for consideration. Alternate No. 4 was selected as the final design, but Park Service Office Engineer Nathan W. Morgan specified the use of larger stones for the facing and the base of the abutments. He also changed the sidewalks to curve at the bridge wings. Like a number of the Yosemite Valley bridges, the new span was designed to appear of native stone construction, though the granite walls conceal reinforced concrete formwork and a compacted-earth fill.⁸ Such work is characteristic of the "rustic style" of architecture then prevalent in the national parks.

Preliminary excavation work at the bridge site began in October 1927. The footings were dug in February 1928, and all preparation work was completed in March. The contractor went to a double shift to avoid the spring rise in the river, and began pouring the concrete as soon as the footings were excavated. The park's acting superintendent noted in his monthly report that the pouring was completed only two hours before the water rose at the bridge site.⁹

The arch centering was erected in April, and by the end of the month, the one-inch steel reinforcing rods were ready to be placed. These were laid on one-foot centers and mounted in hooped stirrups. Half-inch transverse rods were laid across the top and bottoms of the forms for the barrel vault. Loops of doubled #9 wire were extended from joints in every three square feet of surface to anchor the rock to the concrete. No steel passed across expansion joints. The concrete for the arch ring was poured in May. The use of several keys or spaces was implemented in the construction of the arch and several pours were required. According to construction drawings, the shear key was 2" deep, 4" wide at the crown, increasing to a width at the spring line equal to one third of the thickness of the wall. Voussoirs were attached with steel cramps which were subsequently embedded in the concrete. The bottom of the voussoirs and the top of the guard rail were given a smooth regular service by rough hammering where necessary. Equestrian tunnels were built by the end of June, following the same general procedure as the main arch. Footings for the wing walls were excavated next, and the centering for the arch was removed. In July, the spandrel and wing walls were complete as high as the concrete back wall. These walls were provided with weep holes consisting of 3" tile drains spaced on 8" centers. By summer's end, the waterproof membrane coating had been applied to the concrete surfaces, and the backfill was placed on the bridge. This fill came in part from below the Kenneyville No. 1 or Ahwahnee Bridge. Clarks Bridge was completed in September, at a total cost of \$40,601.22.¹⁰ The structure was accepted by the National Park Service on 10 November 1928.¹¹

Stone for the bridge's veneer was quarried in the park, and sand used in its construction was taken from Wildcat Creek, as well as from below the Kenneyville No. 1 Bridge. Crushed rock used in the fill came from the plant near Pohono Bridge. The arch ring stones or voussoirs, 15" to 24" in thickness, were cut from wooden templates and fitted into place. These

dressed stones contrast with the uneven stone boulders with which the wing walls, spandrel walls, and abutments are faced. Contractors Rocca and Caletti of San Francisco built the bridge under the supervision of the Bureau of Public Roads.¹²

Paving was done under a separate contract. The base course was of rough graded crushed stone, and the next course of fine graded stone. Five inches of bituminous pavement was then applied; it was premixed in the following proportions: 27 cubic feet crushed rock, 4 cubic feet stone fines, 210 pounds bitumuls, and 105 gallons of water per cubic yard. The paving mix was made in a pug mill at the Pohono quarry site, then hauled the 6 1/2 miles to the bridge site, where it was spread and rolled. The curb stones were then set, and the sidewalks filled and paved. Total cost of the paving project was \$1060.17.¹³

Workers from the Emergency Conservation Works landscaped around the bridge site to hide visible construction scars in 1934, seeding native plants and planting young willows.¹⁴

A bridge inspection conducted by the Federal Highway Administration in 1977 found no defects and recommended no work other than routine maintenance.¹⁵ The bridge remains in use, providing access to Curry Company stables and access to sites in the northeast end of Yosemite Valley.

III. ENDNOTES

1. See Capt. George M. Wheeler, U.S. Army Corps of Engineers, "Topographic Map of the Yosemite Valley," 1883. Copy in Yosemite Research Library.
2. Linda Wedel Greene, *Yosemite, The Park and Its Resources: A History of the Discovery, Management, and Physical Development of Yosemite National Park, California*, 3 vols. (Washington: National Park Service, 1987), Vol. I, 283.
3. *Ibid.*, 415-17.
4. Gabriel Sovulewski, "Report of the Park Supervisor," in William W. Forsyth, "Report of the Acting Superintendent of the Yosemite National Park," in *Reports of the Department of the Interior*, 1913, 2 vols. (Washington: Government Printing Office, 1914), I:735.
5. Greene, II:716.
6. Washington B. Lewis, Superintendent's Monthly Report, August 1927, 6.
7. E. P. Leavitt, Acting Superintendent's Monthly Report, January 1928, 2.
8. Robert Charles Pavlik, "In Harmony with the Landscape: A History of the Built Environment of Yosemite National Park, 1915-1940," (Master's thesis, University of California at Santa Barbara, 1986), 47-48; Nathan W. Morgan, Office Engineer, National Park Service, Mesa Verde National Park, to Bert H. Burrell, Acting Chief Civil Engineer, National Park Service, Portland, Oregon, 4 October 1925, National Archives, Record Group 79, Entry 22, Box 18, Mesa Verde file.
9. Leavitt, Acting Superintendent's Monthly Report, October 1927, 8; Acting Superintendent's Monthly Report, February 1928, 5; Acting Superintendent's Monthly Report, March 1928, 5.
10. Leavitt, Acting Superintendent's Monthly Report, April 1928, 4; E. C. Solinsky, Acting Superintendent's Monthly Report, May 1928, 6; Leavitt, Acting Superintendent's Monthly Report, June 1928, 4; Acting Superintendent's Monthly Report, July 1928, 4; Acting Superintendent's Monthly Report, September 1928, 3; Merrill Ann Wilson, National Register of Historic Places nomination for the Yosemite Valley bridges, August 1976, Sec. 7, p. 2. See also "Yosemite National Park, Plans for Five Bridges," Sheet 7c, "Clarks Bridge over Merced River," February 1928; Sheet 3, "Details of Construction," December 1927. Copies at National Park Service, Denver Service Center.
11. Pavlik, 48.
12. *Ibid.*, 47-48.

13. Charles Goff Thomson, Superintendent, and O. G. Taylor, Park Resident Engineer, "Final Construction Report #37, Paving, Clark's Bridge," 6 December 1929, 1. Yosemite National Park Maintenance and Engineering Office.
14. Thomson, Superintendent's Monthly Report, February 1934, 10.
15. Lonnie E. Moss, Bridge Safety Inspection Report, Clark's Bridge, (Denver, CO: Federal Highway Administration Region 8, Office of Western Bridge Design, 27 January 1977).

V. BIBLIOGRAPHY

UNPUBLISHED PUBLIC DOCUMENTS

Leavitt, E. P. Acting Superintendent's Monthly Report, January 1928.

--Acting Superintendent's Monthly Report, February 1928.

--Acting Superintendent's Monthly Report, March 1928.

--Acting Superintendent's Monthly Report, April 1928.

--Acting Superintendent's Monthly Report, June 1928.

--Acting Superintendent's Monthly Report, July 1928.

--Acting Superintendent's Monthly Report, September 1928.

Lewis, Washington B. Superintendent's Monthly Report, August 1927.

Moss, Lonnie E. Bridge Safety Inspection Report, Clark's Bridge, Yosemite National Park. Denver, CO: Federal Highway Administration, 27 January 1977.

[National Park Service Landscape Architecture Division?]. "Yosemite National Park, Plans for Five Bridges." Construction drawings, eight sheets. 1927-1928. Copies at National Park Service, Denver Service Center.

Solinsky, E. C. Acting Superintendent's Monthly Report, May 1928.

Sovulewski, Gabriel. "Report of the Park Supervisor," in William W. Forsyth, "Report of the Acting Superintendent of the Yosemite National Park," in *Reports of the Department of the Interior*, 1913, 2 vols. Washington, D.C.: Government Printing Office, 1914, Vol. I, 735.

Thomson, Charles Goff. Superintendent's Monthly Report, February 1934.

Thomson, Charles Goff and O. G. Taylor, Park Resident Engineer, "Final Construction Report #37, Paving, Clark's Bridge," 6 December 1929, 1. Yosemite National Park Maintenance and Engineering Office.

Washington, D.C., National Archives. Nathan W. Morgan, Office Engineer, National Park Service, Mesa Verde National Park, to Bert H. Surrell, Acting Chief Civil Engineer, National Park Service, Portland, Oregon, 4 October 1925. Record Group 79, Entry 22, Box 18, Mesa Verde file.

Wheeler, George, U.S. Army Corps of Engineers, "Topographic Map of the Yosemite Valley," 1883. Copy in Yosemite Research Library.

Wilson, Merrill Ann. National Register of Historic Places nomination for the Yosemite Valley Bridges, August 1976.

THESES AND DISSERTATIONS

Pavlik, Robert Charles. "In Harmony with the Landscape: A History of the Built Environment of Yosemite National Park, 1915-1940." (Master's thesis, University of California at Santa Barbara, 1986).